WE CLAIM

1.   A method comprising:

providing at least one spread sequence portion;

providing a cyclic redundancy; and

5   forming a transmitted sequence based on the spread sequence portion and the cyclic redundancy.

2.   The method of claim 1, wherein the spread sequence portion is a fraction of a spread sequence.

3.   The method of claim 1, wherein the spread sequence portion is at 10   least one spread sequence.

4.   The method of claim 1, wherein the spread sequence portion comprises a plurality of concatenated spread sequences.

5.   The method of claim 1, wherein the spread sequence portion comprises a baseband chip-level sequence.

15   6.   The method of claim 5, wherein the baseband chip-level sequence is computed according to:

$$s[i,b] = \sum_{u=1}^{U} A_u \sum_{k=0}^{K-1} d_u[k,b] c[i,b] W_u[i-Nk] , \quad 0 \le i \le NK - 1.$$

7.   The method of claim 1, wherein the spread sequence portion comprises a multicode sequence.

20   8.   The method of claim 1, wherein the forming comprises inserting cyclic redundancy to the spread sequence portion for at least one symbol boundary.

9.   The method of claim 1, wherein the cyclic redundancy comprises zero value chips.

10.   The method of claim 1, wherein the cyclic redundancy comprises a known sequence.

5   11.   The method of claim 1, wherein the transmitted sequence is formed according to:

$$x[i,b] = \begin{cases} s[i,b], & 0 \le i \le NK - 1 \\ s[i - NK, b], & NK \le i \le NK + L_p - 1 \end{cases}$$

12.   The method of claim 1, wherein the transmitted sequence is formed according to:

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$$x[i,b] = \begin{cases} s[i + NK - L_p, b], & 0 \le i \le L_p - 1 \\ s[i - L_p, b], & L_p \le i \le NK + L_p - 1 \end{cases}.$$

13.   The method of claim 1, wherein the forming of the transmitted sequence comprises inserting the cyclic redundancy as a cyclic prefix to at least one spread sequence portion and as a cyclic postfix to at least one spread sequence portion.

15   14.   A communication apparatus comprising a transmitting device to form a transmitted sequence based on a spread sequence and a cyclic redundancy.

15.   The communication apparatus of claim 14, wherein the spread sequence portion is a fraction of a spread sequence.

20   16.   The communication apparatus of claim 14, wherein the spread sequence portion is at least one spread sequence.

17.   The communication apparatus of claim 14, wherein the spread sequence portion comprises a plurality of concatenated spread sequences.

18.   The communication apparatus of claim 14, wherein the at least one spread sequence portion comprises a baseband chip-level sequence.

19.   The communication apparatus of claim 18, wherein the baseband chip-level sequence is computed according to:

$$s[i,b] = \sum_{u=1}^{U} A_u \sum_{k=0}^{K-1} d_u[k,b] c[i,b] W_u[i-Nk], \quad 0 \le i \le NK-1.$$

20.   The communication apparatus of claim 14, wherein the spread sequence portion comprises a multicode sequence.

21.   The communication apparatus of claim 14, wherein the forming of the transmitted sequence comprises inserting cyclic redundancy to the spread sequence for at least one symbol boundary.

22.   The communication apparatus of claim 14, wherein the cyclic redundancy comprises zero value chips.

23.   The communication apparatus of claim 14, wherein the cyclic redundancy comprises a known sequence.

24.   The communication apparatus of claim 14, wherein the transmitted sequence is formed according to:

$$x[i,b] = \begin{cases} s[i,b], & 0 \le i \le NK-1 \\ s[i-NK,b], & NK \le i \le NK+L_p-1 \end{cases}.$$

25.   The communication apparatus of claim 14, wherein the transmitted sequence is formed according to:

$$x[i,b] = \begin{cases} s[i+NK-L_p,b], & 0 \le i \le L_p-1 \\ s[i-L_p,b], & L_p \le i \le NK+L_p-1 \end{cases}.$$

26.   The communication apparatus of claim 14, wherein the forming of the transmitted sequence comprises inserting the cyclic redundancy as a cyclic prefix to at least one spread sequence portion and as a cyclic postfix to at least one spread sequence portion.

5   27.   A communication system comprising:
        means for providing at least one spread sequence portion; and
        means for inserting a cyclic redundancy to the spread sequence portion to form a transmitted sequence.

        28.   The communication system of claim 27, further comprising means
10   for creating a cyclic redundancy.

        29.   A computer readable medium storing a computer program comprising computer readable code for forming a sequence based on a cyclic redundancy and at least one spread sequence portion.

        30.   The computer readable medium of claim 29, wherein the spread
15   sequence portion is a fraction of a spread sequence.

        31.   The computer readable medium of claim 29, wherein the spread sequence portion is at least one spread sequence.

        32.   The computer readable medium of claim 29, wherein the spread sequence portion comprises a plurality of concatenated spread sequences.

20   33.   The computer readable medium of claim 29, wherein the at least one spread sequence portion comprises a baseband chip-level sequence.

        34.   The computer readable medium of claim 29, wherein the baseband chip-level sequence is computed according to:

$$s[i,b] = \sum_{u=1}^{U} A_u \sum_{k=0}^{K-1} d_u[k,b] f[i,b] W_u[i-Nk] , \quad 0 \le i \le NK - 1.$$

35.   The computer readable medium of claim 29, wherein the spread sequence portion comprises a multicode sequence.

36.   The computer readable medium of claim 29, wherein the forming comprises inserting cyclic redundancy to the spread sequence portion for at least one symbol boundary.

37.   The computer readable medium of claim 29, wherein the cyclic redundancy comprises zero value chips.

38.   The computer readable medium of claim 29, wherein the cyclic redundancy comprises a known sequence.

39.   The computer readable medium of claim 29, wherein the sequence is formed according to:

$$x[i,b] = \begin{cases} s[i,b], & 0 \le i \le NK - 1 \\ s[i - NK, b], & NK \le i \le NK + L_p - 1 \end{cases}.$$

40.   The computer readable medium of claim 29, wherein the sequence is formed according to:

$$x[i,b] = \begin{cases} s[i + NK - L_p, b], & 0 \le i \le L_p - 1 \\ s[i - L_p, b], & L_p \le i \le NK + L_p - 1 \end{cases}.$$

41.   The computer readable medium of claim 29, wherein the forming of the sequence comprises inserting the cyclic redundancy as a cyclic prefix to at least one spread sequence portion and as a cyclic postfix to at least one spread sequence portion.

42.   A method of operating a communication apparatus, comprising:
        converting a plurality of receive samples from at least one spread sequence portion into a plurality of frequency domain samples; and
        determining an equalized signal based on the frequency domain samples.

43.   The method of claim 42, further comprising:

determining a plurality of frequency domain equalization weights for the frequency domain samples; and

determining a time domain signal estimate based on the frequency domain equalization weights and frequency domain samples.

44.   The method of claim 42, wherein the receive samples include cyclic redundancy.

45.   The method of claim 44, wherein the receive samples including cyclic redundancy are converted into the plurality of frequency domain samples.

46.   The method of claim 42, further comprising: receiving the receive samples at a plurality of receiver branches.

47.   The method of claim 42, wherein the receive samples comprise chip-spaced samples.

48.   The method of claim 42, wherein the frequency domain equalization weights are determined based on a power weight, a plurality of frequency domain channel estimates, and one of at least one noise power, at least one interference power, and at least one noise plus interference power.

49.   The method of claim 43, wherein the frequency domain equalization rates are determined according to:

$$\mathbf{w}[k,b] = \left(\sum_{j=1}^{J} \mathbf{H}_j[k,b]\mathbf{H}_j^H[k,b] + \sigma^2\mathbf{I} \right)^{-1} \mathbf{H}_1[k,b].$$

50.   The method of claim 43, wherein the frequency domain equalization rates are determined according to:

$$\mathbf{w}[k,b] = \left\{ \boldsymbol{\Theta}[k,b] \left(\boldsymbol{\Theta}^H[k,b]\boldsymbol{\Theta}[k,b] \right)^{-1} \right\}_1.$$

51.   The method of claim 43, wherein the frequency domain equalization weights are determined according to:

$$\mathbf{w}[k,b] = \frac{\sqrt{\alpha}\mathbf{H}[k,b]}{\alpha\mathbf{H}^H[k,b]\mathbf{H}[k,b]+\sigma^2(k)}.$$

5   52.   The method of claim 43, wherein the frequency domain equalization weights are scaled according to:

$$\beta = \frac{1}{\frac{1}{NK}\sum_{k=0}^{NK-1}\mathbf{w}^H[k,b]\mathbf{H}[k,b]}.$$

53.   The method of claim 42, further comprising: removing a cyclic redundancy from the receive samples prior to converting to the frequency domain

10   samples.

54.   The method of claim 43, wherein the frequency domain equalization weights are determined according to:

$$\mathbf{w}[k,b] = \frac{\mathbf{H}[k,b]}{\mathbf{H}^H[k,b]\mathbf{H}[k,b]+\dfrac{\sigma^2(k)}{\alpha}}.$$

55.   A communication apparatus comprising:

15   means for converting a plurality of receive samples from at least one spread sequence portion into a plurality of frequency domain samples; and

means for determining an equalized signal based on the frequency domain samples.

56.   The communication apparatus of claim 55, further comprising:

20   means for determining a plurality of frequency domain equalization weights for the frequency domain samples; and

means for determining a time domain signal estimate based on the frequency domain equalization weights and frequency domain samples.

57.   A communication apparatus comprising a receiving device to convert a plurality of receive samples from at least one spread sequence portion into a plurality of frequency domain samples, to determine an equalized signal

5   based on the frequency domain samples.

58.   The communication apparatus of claim 57, wherein the receiving device determines a plurality of frequency domain equalization weights for the frequency domain samples, and determines a time domain signal estimate based on the frequency domain equalization weights and frequency domain samples.

10   59.   The communication apparatus of claim 57, wherein the receive samples include cyclic redundancy.

60.   The communication apparatus of claim 59, wherein the receive samples including cyclic redundancy are converted into the plurality of frequency domain samples.

15   61.   The communication apparatus of claim 57, wherein the receiver device comprises a plurality of receiver branches to receive the receive samples.

62.   The communication apparatus of claim 57, wherein the receive samples comprise chip-spaced samples.

63.   The communication apparatus of claim 58, wherein the receiver

20   device determines the frequency domain equalization weights based on a power weight, a plurality of frequency domain channel estimates, and one of at least one noise power, at least one interference power, and at least one noise plus interference power.

64.   The communication apparatus of claim 58, wherein the frequency domain equalization rates are determined according to:

$$\mathbf{w}[k,b] = \left(\sum_{j=1}^{J} \mathbf{H}_j[k,b]\mathbf{H}_j^H[k,b] + \sigma^2 \mathbf{I} \right)^{-1} \mathbf{H}_1[k,b].$$

65.   The communication apparatus of claim 58, wherein the frequency domain equalization rates are determined according to:

$$\mathbf{w}[k,b] = \left\{ \mathbf{\Theta}[k,b]\left(\mathbf{\Theta}^H[k,b]\mathbf{\Theta}[k,b] \right)^{-1} \right\}_1.$$

66.   The communication apparatus of claim 58, wherein the frequency domain equalization weights are determined according to:

$$\mathbf{w}[k,b] = \frac{\sqrt{\alpha}\mathbf{H}[k,b]}{\alpha\mathbf{H}^H[k,b]\mathbf{H}[k,b] + \sigma^2(k)}.$$

67.   The communication apparatus of claim 58, wherein the frequency domain equalization weights are scaled according to:

$$\beta = \frac{1}{\dfrac{1}{NK}\displaystyle\sum_{k=0}^{NK-1}\mathbf{w}^H[k,b]\mathbf{H}[k,b]}.$$

68.   The communication apparatus of claim 57, wherein the receiving device removes a cyclic redundancy from the receive samples prior to converting to the frequency domain samples.

69.   The communication apparatus of claim 58, wherein the frequency domain equalization weights are determined according to:

$$\mathbf{w}[k,b] = \frac{\mathbf{H}[k,b]}{\mathbf{H}^H[k,b]\mathbf{H}[k,b] + \dfrac{\sigma^2(k)}{\alpha}}.$$

70.   A computer readable medium including a program comprising:

computer readable code for converting a plurality of receive samples from at least one spread sequence portion into a plurality of frequency domain samples; and

computer readable code for determining an equalized signal based on the frequency domain samples.

71.   The computer readable medium of claim 70, further comprising:

computer readable code for determining a plurality of frequency domain equalization weights for the frequency domain samples; and

computer readable code for determining a time domain signal estimate based on the frequency domain equalization weights and frequency domain samples.

72.   The computer readable medium of claim 70, wherein the receive samples include cyclic redundancy.

73.   The computer readable medium of claim 72, wherein the receive samples including cyclic redundancy are converted into the plurality of frequency domain samples.

74.   The computer readable medium of claim 70, further comprising: receiving the receive samples at a plurality of receiver branches.

75.   The computer readable medium of claim 70, wherein the receive samples comprise chip-spaced samples.

76.   The computer readable medium of claim 71, wherein the frequency domain equalization weights are determined based on a power weight, a plurality of frequency domain channel estimates, and one of at least one noise power, at least one interference power, and at least one noise plus interference power.

5   77.   The computer readable medium of claim 71, wherein the frequency domain equalization rates are determined according to:

$$\mathbf{w}[k,b] = \left(\sum_{j=1}^{J} \mathbf{H}_j[k,b]\mathbf{H}_j^H[k,b] + \sigma^2 \mathbf{I} \right)^{-1} \mathbf{H}_1[k,b].$$

78.   The computer readable medium of claim 71, wherein the frequency domain equalization rates are determined according to:

10      $$\mathbf{w}[k,b] = \left\{ \mathbf{\Theta}[k,b]\left(\mathbf{\Theta}^H[k,b]\mathbf{\Theta}[k,b] \right)^{-1} \right\}_1.$$

79.   The computer readable medium of claim 71, wherein the frequency domain equalization weights are determined according to:

$$\mathbf{w}[k,b] = \frac{\sqrt{\alpha}\mathbf{H}[k,b]}{\alpha\mathbf{H}^H[k,b]\mathbf{H}[k,b] + \sigma^2(k)}.$$

80.   The computer readable medium of claim 71, wherein the frequency
15   domain equalization weights are scaled according to:

$$\beta = \frac{1}{\frac{1}{NK}\sum_{k=0}^{NK-1} \mathbf{w}^H[k,b]\mathbf{H}[k,b]}.$$

81.   The computer readable medium of claim 70, further comprising: removing a cyclic redundancy from the receive samples prior to converting to the frequency domain samples.

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82.   The computer readable medium of claim 71, wherein the frequency domain equalization weights are determined according to:

$$\mathbf{w}[k,b] = \frac{\mathbf{H}[k,b]}{\mathbf{H}^H[k,b]\mathbf{H}[k,b] + \dfrac{\sigma^2(k)}{\alpha}} \;.$$

83.   A communication apparatus for using a communication signal

5   format, said format comprising:

at least one chip-level sequence, and

at least one chip-level cyclic redundancy sequence, concatenated with the at least one chip-level sequence.

10   84.   The apparatus of claim 83 wherein the chip-level sequence is a multicode chip-level sequence.